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PLANTS OF SOUTHERN UNITED STATES[1]

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I. Viburnum dentatum L.

(Plate 585)

The perennial courtesy of Mr. Spencer Savage, who has provided me with the accompanying photograph of *Viburnum dentatum*, (pl. 585) made possible the examination of *Viburnum* in Linnaeus' herbarium at London in the summer of 1937. Through an examination of this type, interpretation of the complex *V. dentatum* series, especially in the mountains of the southern United States, has been greatly simplified.

Linnaeus' diagnosis of *V. dentatum*[2] was exceedingly brief:

> 4. Viburnum foliis ovatis dentato-serratis ovatis.
> *Habitat in* Virginia.

In the second edition (1762, p. 384) the last "ovatis" was changed to "plicatis."

A single sheet, bearing at the bottom the annotation "*dentatum*" in Linnaeus' hand and on the reverse side "Opulus ex America," shows at a glance that it does not represent *Viburnum dentatum* as recognized by botanists of the northeastern United States. The specimen has an inflorescence and four coarsely dentate leaves. The lower leaves are 8.5 cm. long and 10 cm. wide (*i. e.* wider than long), with petioles covered by setose yellow pubescence. The upper leaf-surface has long, usually appressed, scattered hairs, which are con-

[1] Brooklyn Botanic Garden Contributions, No. 89. Plates 585–587 supplied by that institution.

[2] Sp. Pl. 268 (1753).

spicuous on the veins toward the petioles. The lower leaf-surface is glabrous, except for tufts of stellate hairs in the axils of the veins. Inflorescence-branches are somewhat scabrous, as are also the petioles and veins of the lower surface of the leaf. Brown glands are conspicuous on the hypanthium. From general appearance and microscopic details it is obvious that true *Viburnum dentatum* (represented by the specimen under discussion) is the plant now passing as *V. pubescens* var. *Canbyi*.

The first adequate treatment of *V. dentatum*, after Linnaeus, was that of Solander,[1] who added the word "subcordatis" in his description of the leaves. He recognized three variations of *Viburnum dentatum* (see Blake, l. c.): the typical α *lucidum*, with glabrous leaves; β *pubescens*, with leaves villous below; and γ *sessile*, with short-petioled leaves villous below. These entities, worked out by Blake, are as follows:

α *lucidum* (based on a Bartram specimen received in 1764) "good *V. dentatum* L. as now taken by all authors";
β *pubescens* (Hort. Dr. Lee) "the plant now passing as *V. venosum* Britton";
γ *sessile* (from Bartram's collection from the Catskill Mts.) = *Viburnum affine* Bush.

Aiton did not publish var. *sessile*, and Pursh's *V. pubescens* therefore rested directly upon var. β. Of this Blake says (p. 12), "It is probable, furthermore, that the plant which Pursh really had in mind as *V. pubescens* was *V. venosum*, for the only specimens of the *V. dentatum* group collected by Pursh which I was able to find at the Kew Herbarium consisted of a branch of *V. venosum* on a sheet with two scraps of the somewhat pubescent form of *V. dentatum*, the whole labeled *Viburnum dentatum* in an old hand which Mr. Skan, the librarian at Kew, was not able to identify."

Specific differentiation in the *dentatum*-group has been based almost entirely on the presence and distribution of stellate hairs, but all sorts of combinations involving the presence or absence of stellate or simple hairs on inflorescence-branches, petioles or lower leaf-surfaces can be demonstrated. Even a cursory examination with a binocular microscope shows that most of the specimens of the northern phase of *V. dentatum* have some stellate hairs in the axils of the leaves and that

[1] See S. F. Blake, RHODORA XX. 11 (1918), for an excellent discussion of Solander's manuscript, which was the basis of Aiton's descriptions (Hort. Kew., 1789) and consequently those of Pursh (1814).

the pubescence is by no means confined to the leaf-axils. Torrey & Gray[1] understood the situation when they remarked "The northern plant is very common, and uniform in appearance: the leaves are 2–3 inches long and often of nearly the same width . . . quite glabrous, except the tufts in the axils of the veins, and a few scattered hairs on the young petioles and veins beneath . . . But in Pennsylvania this same plant becomes more pubescent; a few scattered hairs often appearing on the upper surface of the leaves, while the young petioles and peduncles are clothed with separate or fasciculate hairs." How shallow the division into so-called species has been, can be seen from the key in Britton & Brown's Illustrated Flora, iii. 269 (1913):

Leaves glabrous, or with tufts of hairs in the axils beneath . . . . . *V. dentatum.*
Leaves pubescent beneath, the pubescence more or less stellate.
  Veins of the leaves not very prominent . . . . . *V. scabrellum.*
  Veins very prominent on the under sides of the leaves . . . . . *V. venosum.*

The type of *V. venosum*[2] came from Nantucket Island, Massachusetts (coll. *E. P. Bicknell* in 1899), with "twigs and lower surfaces of the leaves very densely stellate-tomentose," and according to Bicknell (Bull. Torr. Bot. Club xlii. 348 (1915)) blooming somewhat later than "*V. dentatum.*" It is the only representative in the vicinity of Woods Hole on Cape Cod, where it appears to be distinct from *V. dentatum*, and has been so recognized by all recent botanists (cf. Fogg, RHODORA xxxii. 276 (1930)), but such a distinction is not tenable on the mainland to the westward.

V. venosum var. *Canbyi* Rehder[3] "Differs from the type by its thinner, less pubescent leaves, often only pubescent along the midrib beneath, especially those below the inflorescence much larger, often 5 to 8 cm. broad and the larger inflorescence like the young branchlets only slightly pubescent. This is apparently the form mentioned by Torrey & Gray in their Flora as intermediate between *V. dentatum* and *V. dentatum scabrellum.*" No type was designated by Rehder, but a number of collections by Canby were cited from Delaware and Pennsylvania.

Excellent specimens, collected by C. S. Schneider in the Arnold Arboretum (hb. Brooklyn Bot. Gard.) under the names *V. dentatum* (no. 613–2) and *V. venosum* var. *Canbyi*, have ovate fruits averaging

[1] Fl. N. Am. ii. 16 (1841).
[2] Britton, Man. 871 (1901).
[3] RHODORA vi. 60 (1904).

when dry 6 mm. long (stones 5.0 x 3.7 mm.) and globose fruits (stones 5.0 x 4.5 mm.), respectively. These stone-differences seem to parallel the differences in rotundity of the leaves. The stamen-characters, in this instance, are the opposite of those illustrated by Schneider, Handb. Laubh. ii, fig. 414 k, v (1912).

V. dentatum β *?scabrellum* Torrey & Gray,[1] described as having "young branchlets and peduncles scabrous and often hairy; leaves (often large) roundish-cordate or ovate, coarsely and rather obtusely toothed, pubescent beneath; petioles and peduncles shorter," was based directly on "V. dentatum (α & β chiefly), Michx.! fl. 1. p. 179; Ell. sk. i. p. 365," without further citation of specimens. The uncertainty was not decreased by their notation under *V. pubescens:* "Perhaps the plant which Pursh, and even Aiton, had in view, may have been our V. dentatum β. scabrellum," and it is evident from the specimens in the Torrey Herbarium that no clear differentiation was in mind. The basic synonymy reverts to Michaux's[2] descriptions of *Viburnum dentatum* vars. α *glabellum* and β *semitomentosum;* the former from the high mountains of Carolina, with suborbicular or short-ovate leaves; the latter smaller, with oval leaves tomentose below, from thickets in lower Carolina.[3] Michaux further stated that he had grown and compared living plants of both varieties and found no essential differences, but just what Michaux had in mind for var. *semitomentosum* can be determined only by an examination of the Michaux Herbarium. I am now treating var. *semitomentosum* as an extreme characteristic of the southern coastal plain, with small ovate scarcely cordate leaves pubescent below and only obscurely dentate, and with scabrellous branches. This is essentially *V. molle* var. ? *tomentosum* of Chapman's Flora, well represented in its extreme form by Curtiss' (2nd distr.) no. 5896 from River Junction, Florida. In this collection the leaves vary from ovate to cuneate, and are glandular below as well as sparsely stellate-pubescent, whereas the hypanthium is not glandular.

Typical *V. dentatum* is thus seen as characteristic of the Middle States and especially of the mountainous areas, passing locally into pubescent forms (var. *pubescens*). The northern part of the range, southward to Pennsylvania, is occupied almost exclusively by var.

[1] Fl. N. Am. ii. 16 (1841).

[2] Fl. Bor.-Am. i. 179 (1803).

[2] Elliott's treatment was a combination of Michaux and Pursh and offered nothing new.

lucidum. Var. *semitomentosum* appears to be equally characteristic of the southern coastal plain.

The variations of *V. dentatum,* as I see them, are essentially as follows:

Lower surface of leaf glabrous except for tufts in the axils of the veins (or sometimes with scattered hairs on the larger veins, or on the leaf surface).
Hypanthium glandular; petioles and inflorescence-branches scabrous-pubescent; leaves orbicular to ovate, strongly plicate-veined . . . . . *V. dentatum* (typical).
Hypanthium glandless; petioles and inflorescence-branches glabrous or practically so; leaves thinner and usually narrower, less strongly veined . . . . . var. *lucidum.*
Lower surface of the leaf pubescent.
Leaves strongly cordate, orbicular to ovate . . . . . var. *pubescens.*
Leaves not cordate, ovate to cuneate (southern coastal plain) var. *semitomentosum.*

V. pubescens var. *Deamii* Rehder, Journ. Arnold Arb. v. 58, 59 (1924),[1] with stipules frequently present, branches glabrous, and leaves with the lower surface stellate-pubescent, should perhaps be separated. It seems to articulate with typical *V. dentatum* as represented on the Cumberland Plateau. The shallow crenate dentation of var. *Deamii* illustrated by Deam, Shrubs of Indiana, pl. 143 (1924), of which var. *indianense* Rehder, l. c., is held by Deam to be "only a form," can be readily duplicated in specimens from southeastern Masaschusetts (cf. Pepoon's collection from Woods Hole, July 5, 1897). *V. semitomentosum* (Michx.) Rehder, as treated by Small, Man. 1271 (1933) has its "counter-part" in *V. carolinianum* Ashe[2] of the Blue Ridge, with "large, coarsely-toothed leaf-blades." A fragmentary collection at the New York Botanical Garden from Union County, Georgia, has large, intensely hairy, almost velvety leaves. *V. Ashei* Bush, Am. Midland Nat. ix. 192 (1924), from southern Mississippi, described as having small cordate or subcordate leaves 4–6 cm. long, is evidently close to var. *semitomentosum.*

Essential bibliography of *V. dentatum* and its varieties is as follows:

V. DENTATUM L. Sp. Pl. 268 (1753); Jacquin, Hort. t. 36 (1770).[3] *V. venosum* Britton var. *Canbyi* Rehder in RHODORA vi. 60 (1904); Robinson & Fernald in Gray, Man. ed. 7, 760 (1908); Schneider, Handb. Laubh. ii. 647, fig. 415 h, i (1912). *V. pubescens* Pursh var. *Canbyi* Blake in RHODORA xx. 15 (1918).

[1] V. *Deamii* Bush, Am. Midland Nat. x. 239 (1927).

[2] Bull. Charleston Museum xiv. 31 (1918).

[3] Scarcely identifiable as to variety, but with much narrower leaves than in the Linnaean type.

Var. PUBESCENS Ait. Hort. Kew i. 372 (1789). *V. pubescens* Pursh, Fl. Am. Sept. i. 202 (1814); Blake in RHODORA xx. 15 (1918); Rehder, Man. Cult. Trees & Shrubs 808 (1927). *V. dentatum* var.? β *scabrellum* T. & G. Fl. N. Am. ii. 16 (1841) (partim). *V. venosum* Britton, Man. 871 (1901); Schneider (l. c.) fig. 414 u-y (1912); Britton & Brown, Ill. Fl. ed. 2, 272, fig. 3964 (1913).

Var. LUCIDUM Ait. Hort. Kew. i. 372 (1789). *V. dentatum* L. sensu Robinson & Fernald in Gray, Man. ed. 7, 760 (1908); Britton & Brown, Ill. Fl. ed. 2, fig. 3962 (1913) and all other recent authors.

Var. SEMITOMENTOSUM Michx. Fl. Bor.-Am. i. 179 (1803). *V. dentatum* var. β ? *scabrellum* T. & G. Fl. N. Am. ii. 16 (1841) (partim). *V. scabrellum* Chapman, Fl. Southern U. S. 172 (1860). *V. molle* var.? *tomentosum* Chapman, Fl. Southern U. S., ed. 3, 190 (1897). *V. semitomentosum* Rehder in RHODORA vi. 59 (1904).

II. SATUREJA GLABELLA (Michx.) Briquet

(Plate 586)

FROM rocky banks of the Cumberland River at Nashville, Michaux (1803) described *Cunila glabella*, an erect glabrous perennial with ovate-lanceolate leaves which were remotely serrate ["rarioribus dentibus serrata"]. This description obviously applied to leaves toward the middle of the stem, since the lowest leaves were stated to be oval, and the upper leaves gradually lanceolate ["superiora gradatim lanceolata"]. Vahl (1804) further described specimens which he received from Richard's herbarium as having an erect simple stem, hardly a foot high, the somewhat serrate leaves about 1½ inches long ["sesquipollicaria"] and the peduncles very short.

These descriptions quite evidently refer also to the large-flowered robust plant (our FIG. 1), apparently not stoloniferous, abounding in the cedar glades southeast of Nashville and accompanied by *Lobelia Gattingeri*, *Scutellaria parvula*, *Arenaria patula*, *Petalostemum Gattingeri*, and other plants typical of the limestone glades. The leaves in robust specimens are 2 to 3 cm. (rarely 3.5 cm.) long with a width up to 9 mm. However, procumbent small-flowered specimens with reduced leaves are occasionally encountered in the cedar glades, and these are in no wise different from the small linear-leaved plants growing northward, on river banks, to Niagara Falls (FIG. 2). All have identical seeds and the same conformation of the calyx lobes (cf. PL. 586). The extremes are now generally considered to be distinct species, though it is evident from current treatments that insufficient attention has been paid to the original description of Michaux.

Although some of this confusion may be attributed to Bentham, yet that distinguished writer more or less disclaimed knowledge as to the identity of *S. glabella* on p. 730 of the supplement (April, 1835) of his "Labiatarum": "Dr. Torrey writes to me that this [*Micromeria glabella*] is not Michaux's *Cunila glabella*, a plant with which I am in that case unaquainted." And Torrey (Fl. N. Y. ii. 68 (1843) cleared up the situation perfectly when he wrote: "The *Cunila glabella* of Michaux, which occurs on rocks in Tennessee, differs from the Niagara plant in being much larger; the leaves all ovate- or obovate-oblong, and toothed. I should have described the latter as a distinct species, had I not received some Ohio specimens, collected by Mr. Sullivant, which connect the two forms."

Part of the difficulty rests with Persoon, who (Syn. Pl. ii. 131 (1807)) changed Michaux's specific name [*Hedeoma*] to "*glabrum*" instead of "*glabella*." This illegitimate name was in turn presumably copied by Nuttall (Genera i. 16 (1818)), though with a transformation of description, so that Nuttall's *Hedeoma glabra* applied primarily to the small form which had been found at Niagara Falls. Taxonomically, therefore, the names *Satureja glabella* (Michx.) Briquet and *S. glabra* (Nuttall) Fernald seem to be based on the same type, and *S. glabra* is therefore to be treated as a pure synonym. Bentham,[1] realizing somewhat vaguely that larger plants with leaves an inch or more in length ("pollicaria vel longiora") were to be separated from dwarf plants with leaves only one-half inch long, and knowing the difficulties with the name *Cunila glabra*, took up for the dwarf plants Torrey & Gray's manuscript name *Micromeria Nuttallii*, at the same time passing over the earlier valid name *Hedeoma arkansana* Nuttall.

The essential bibliography is as follows:

SATUREJA GLABELLA (Michx.) Briquet in Engler & Prantl, Pflanzenfam. iv[3a]. 302 (1896). *Cunila glabella* Michx. Fl. Bor.-Am. i. 13 (1803); Vahl, Enum. Pl. i. 214 (1804). *Hedeoma glabrum* Persoon, Syn. ii. 131 (1807), nomen illegitimum; Pursh, Fl. N. Am. ii. 414 (1814) (as *H. glabra*); Nuttall, Genera i. 16 (1818) (excl. description, in large part). *Satureja glabra* (Nutt.) Fernald in RHODORA x. 85 (1908) (as to name-bringing synonym).—Apparently confined to limestone river bluffs and cedar glades in the vicinity of Nashville, Tennessee.

Var. **angustifolia** (Torr.), n. comb. *Micromeria glabella* Benth. var. *angustifolia* Torr. Fl. N. Y. ii. 67 (1843) (with synonymy). *Hedeoma arkansana* Nutt. in Trans. Am. Phil. Soc. n. s. v. 186 (1834). *Calamintha Nuttallii* Benth. in DC. Prodr. xii. 230 (1848). *Calamin-*

[1] DC., Prod. xii. 230 (1848).

tha glabella var. *Nuttallii* Gray, Man. ed. 2, 307 (1856). *Satureja arkansana* Briq. (l. c.). *Clinopodium glabrum* Ktze, Rev. Gen. 515 (1891); Britton & Brown, Ill. Fl. fig. 3655 (1913).

In PLATE 586, FIG. 1 is SATUREJA GLABELLA from Davidson County, Tennessee, *Svenson*, no. 8701 (B); FIG. 2, var. ANGUSTIFOLIA from Point Abino, Ontario, *M. O. Steele* in 1887 (B).

III. WOODY SPECIES OF HYPERICUM

(Plate 587)

KEY TO WOODY SPECIES OF EASTERN UNITED STATES:[1]

a. Capsules nearly spherical, 1-celled (i. e. not lobed, and their placentae therefore parietal); low or prostrate plants not exceeding 0.5 m. in height....b.
  b. Petals 10–12 mm. long; calyx-lobes 6–12 mm. long, often equalling the capsule.....8. *H. dolabriforme.*
  b. Petals 5–8 mm. long; calyx-lobes 3–5 mm. long, much shorter than the capsule.....9. *H. sphaerocarpum.*
a. Capsules elongated, lobed, 3–5-celled by the intruding placentae; often tall woody bushes....c.
  c. Capsules 5-celled, with styles most frequently 5.
    Flowers 1–1.5 cm. broad, densely aggregated
      3. *H. densiflorum* var. *lobocarpum.*
    Flowers 2–3 cm. broad, in a loose inflorescence....1. *H. Kalmianum.*
  c. Capsules 3-celled (often 4–5-celled in *H. densiflorum*)....d.
    d. Dwarf plants, diffusely spreading or decumbent....13. *H. Buckleyi.*
    d. Erect or often bushy-branched shrubs, usually 0.5 m. or more high....e.
      e. Plants of wet places with slightly woody base and prominent stolons.....12. *H. adpressum.*
      e. Plants without prominent stolons....f.
        f. Flowers in a naked, regularly branched cyme.
          Leaves elliptic to ovate-lanceolate (1–2.5 cm. wide), thin, not revolute.....11. *H. nudiflorum.*
          Leaves linear, thickened, and usually with strongly revolute margins (2–6 mm. wide).10. *H. cistifolium.*
        f. Flowers in a more or less leafy inflorescence....g.
          g. Capsules with thick (ca. 0.5–1.0 mm.) ligneous walls; leaves broad and glaucous (1–2 cm. wide); strongly woody.
            Capsules 9–12 mm. long; flowers 2.5–4 cm. in diameter; plants of limestone rocks.....5. *H. frondosum.*
            Capsules 12–13 mm. long, acuminate; plant of river banks on the coastal plain.....7. *H. apocynifolium.*
          g. Capsules with thin walls.....h
            h. Leaves cordate-clasping, ovate to ovate-lanceolate.....14. *H. myrtifolium.*
            h. Leaves more or less narrowed to the base....i.

[1] I have omitted from this discussion *H. Bissellii* Robinson, RHODORA iv. 136, pl. 37 (1902), a species which I do not sufficiently understand. For the loan of an extensive series of specimens I am much indebted to Dr. H. A. Gleason of the New York Botanical Garden. Citations (NY) and (B) following specimens refer to New York and Brooklyn respectively.

i. Leaves usually conspicuously verticillate and revolute, not exceeding 3 mm. in width, except in var. *pallidum;* inflorescence axillary to paniculate . . . . . 4. *H. galioides.*
i. Leaves not conspicuously verticillate (occasionally so in *H. densiflorum*) . . . . j.
j. Mature capsules 12–15 mm. long (exclusive of styles); leaves mostly 1–1.5 cm. broad, strongly glaucous below . . . . . 6. *H. splendens.*
j. Mature capsules not exceeding 1 cm. (exclusive of styles) . . . . k.
k. Capsules 8–10 mm. long; flowers 1.5–2.5 cm. broad, few in narrow panicles; leaves averaging 1 cm. broad . . . . . 2. *H. prolificum.*
k. Capsules 5–6 mm. long; flowers 1.0–1.5 cm. broad, numerous in corymbose panicles; leaves usually less than 1 cm. wide, frequently revolute . . . . . 3. *H. densiflorum.*

1. H. KALMIANUM L. Sp. Pl. 783 (1753); Coulter in Gray, Syn. Fl. N. Am. 285 (1897); Britton & Brown, Ill. Fl. ii. 530, fig. 2882 (1913). Known only from the region of the Great Lakes, although Coulter, Bot. Gaz. xi. 275 (1886), reported it, probably in error, from the oak barrens at Tullahoma, Tennessee.

The type in the Linnaean Herbarium is a fruiting specimen with 5-styled capsules 4–5 mm. long representing an average plant of *H. Kalmianum* as currently understood.

2. H. PROLIFICUM L. Mant. i. 106 (1767); Coulter in Gray, Syn. Fl. N. Am. 285 (1897); Robinson and Fernald in Gray, Man. ed. 7, 573 (1907). *H. prolificum*, chiefly var. β. T. & G. Fl. N. Am. i. 159 (1838).

The brief diagnosis given by Linnaeus, in his later years, is as follows [from Syst. Plant. ed. Reichard 593 (1780)]:

> H. floribus trigynis: primordialibus sessilibus, caule ancipiti fruticoso, foliis lanceolato-linearibus.
> H. floribus semitrigynis, staminibus corolla brevioribus, caule fruticoso sempervirente. *Gron. virg.* 112. . . .
> Caules *recti, purpurascentes.* Folia *saepius revoluta, unde angusta Rosmarini.* Foliola *ramulorum primordia ex alis plurima.* Panicula *parva, terminalis.* Flores *primae secundaeque dichotomiae sessiles; reliqui terminales, pedunculati, numero rarius ultra* 7. Stamina *petalis non longiora.*

According to B. D. Jackson (Index to the Linnaean Herbarium), Proc. Linn. Soc. Suppl. 1911–1912, 26, 88 (1912), the presence of *H. prolificum* was first recorded by Linnaeus in 1767. There are at present five sheets in the Linnaean Herbarium, as follows:

No. 20. An unbranched fragment exhibiting only 3 flowers, arranged as in a candelabra, with the middle flower sessile. The linear, somewhat reflexed petals are 8 mm. long. The leaves in the verticel immediately

below the inflorescence are revolute, resembling those of *Ledum palustre*, but leaves 5 mm. wide occur in some of the lower verticels. At the base of the sheet is the annotation in Linnaeus' hand "proliferum" "frutice caule ancipite, foliis lineari lanceolatis, paniculo dichotimo, fl – –."

This sheet represents, I believe, a plant of *H. prolificum* in the accepted sense, but in which the leaves are unusually revolute. In this sense the specimen is aberrant, but the condition can be approached in any large series of specimens of *H. prolificum*. The origin of this specimen is unknown. It is evidently the sheet from which much of the diagnosis was drawn, but Linnaeus seems to have realized the underlying situation in describing the leaves as "linearilanceolatis."

No. 21. The upper portion of a plant with eight flowers in a nearly leafless cyme. The flowers are 1.5 cm. in diameter, with short obtuse spreading petals. The leaves are only slightly revolute, rather narrow, becoming 35 mm. long by 5 mm. wide. This specimen has also the notation "proliferum" in Linnaeus' hand, and in Smith's hand "foliosum ex ic. Jacq. n. 25, not L." On the reverse of the sheet "Hypericum idem cum Claytoni no. 552." This specimen is perhaps *H. densiflorum*, judging from the terminal inflorescence, the small flowers and narrow leaves.

No. 22. A specimen of *H. prolificum* as currently understood, with rather obtuse leaves as much as 50 x 11 mm., with the annotation "canadense?" in Linnaeus' hand.

No. 23. A specimen similar to the preceding.

No. 24. Another specimen of current *H. prolificum* with the annotation "Hypericum frutescens . . . vel fortasse spiraea salicifolio Clayt. n. 552."

Everything thus points to sheet no. 20 as the type, holding in mind that the upper leaves are probably aberrantly narrowed and revolute. The larger-leaved specimens of Gronovius, representing the current interpretation of *H. prolificum*,[1] may be included without changing the conception of the species.

3. H. DENSIFLORUM Pursh, Fl. Am. Sept. 376 (1814); Coulter in Gray, Syn. Fl. 285 (1897); Britton & Brown, Ill. Fl. 530, fig. 2884 (1913). *H. foliosum* Jacq. Hort. Schoenbrun. iii. t. 299 (1797), non Aiton (1789). *H. prolificum* sensu T. & G., Fl. N. Am. i. 159 (1838), non L. *H. prolificum* var. *densiflorum* A. Gray, Man. ed. 5, 84 (1867). *H. interior* Small, Bull. Torr. Bot. Cl. xxviii. 359 (1901); Fl. Se. U. S. 789 (1903). *H. glomeratum* Small, Bull. N. Y. Bot. Gard. i. 281 (1899); Man. 871 (1933).

Pursh's type from "dry ridges and savannahs of the Virginia mountains" is unknown, but the flowers were described as in "very

[1] The illustration by Britton & Brown, Ill. Fl. fig. 2883 (1913), probably *H. densiflorum*, does not greatly differ from the plant represented on sheet 21.

abundant and close panicles," the leaves as "lineari-lanceolatis obtusiusculis basi attenuatis." *H. densiflorum* remains the most confusing element among the woody species of *Hypericum*, since the limits are not clearly defined, especially in respect to *H. galioides*. It extends definitely to Arkansas and southeastern Missouri.

H. interior was based on a *Rugel* collection (at least as to TYPE) from Dandridge, Tennessee, but a collection by *Veatch* (without locality) was cited from Texas. It is without question merely *H. densiflorum*, which seems to abound in the Tennessee Valley. *H. glomeratum* was separated from *H. prolificum* "by the small size of all its organs, especially the smaller corollas, and by the terminal inflorescence" and from *H. densiflorum* by the larger corollas and by the congested inflorescence. The capsules of the TYPE of *H. glomeratum* (herb. N. Y. Bot. Gard.) collected near the base (!) of Grandfather Mt., North Carolina (*A. M. Huger*, Aug. 1896), are just 5 mm. long, and they do not differ in any respect from those of *H. densiflorum*. The only material with good flowers labeled *H. glomeratum* by Dr. Small is a collection (*A. A. Heller* no. 21, Aug. 2, 1890) from the summit of Table Rock Mt., North Carolina, and I suspect that this sheet is the source of petal measurements "fully 1 cm. long" in the original description. The *Heller* specimen is good *H. prolificum*, approaching as closely as anything that I have seen to the typical Linnaean specimen. *H. glomeratum* thus seems to have been founded on an ill-assorted mixture of *H. densiflorum* and *H. prolificum*. *H. densiflorum* passes directly into

Var. **lobocarpum** (Gattinger) n. comb. *H. lobocarpum* Gattinger ex Coulter, Bot. Gaz. xi. 275 (1886); Fl. Tenn. 120 (1901); Small, Man. 874 (1933). *H. oklahomense* Palmer, Journ. Arnold Arb. v. 128 (1924).[1]

Gattinger (1901) described the leaves as "linear, obtuse, slightly mucronate, attenuate downward, pale underneath," and Coulter (p. 276) noted that the "broad leaves are exactly those of H. prolificum." Gattinger's specimens from Hollow Rock, West Tennessee, and Hasse's collections from Little Rock, Arkansas, vary in leaf width from 4 mm. to 14 mm., with the average well under 1 cm.; but on the other hand, leaves 1 cm. wide are occasional in *H. densiflorum* from New Jersey. Coulter (l. c.) discusses the precarious limits of *H.*

[1] It is probable that *H. rostratum* Raf. Fl. Ludov. 88 (1817); Eaton, Man. ed. 6, 185 (1833), described as having five styles and a five-angular ovary, is the same as *H. lobocarpum*.

lobocarpum as a species, of which *H. oklahomense* appears to be merely a narrow-leaved form resembling *H. densiflorum*. It is well known that *H. densiflorum* grows both in swamps and on dry slopes, so that habitat is here no indicator of specific differences. Although in some material from the west the capsules are almost invariably 5-lobed, the following comparison is enlightening:

	Capsules 3-lobed	Capsules 4-lobed	Capsules 5-lobed
H. densiflorum, at Brooklyn Botanic Garden, transplanted from the New Jersey pine barrens. (100 capsules)	49	47	4
H. lobocarpum, Biltmore Herb. no. 3989 from Hollow Rock, Tennessee. (25 capsules)	1	16	8

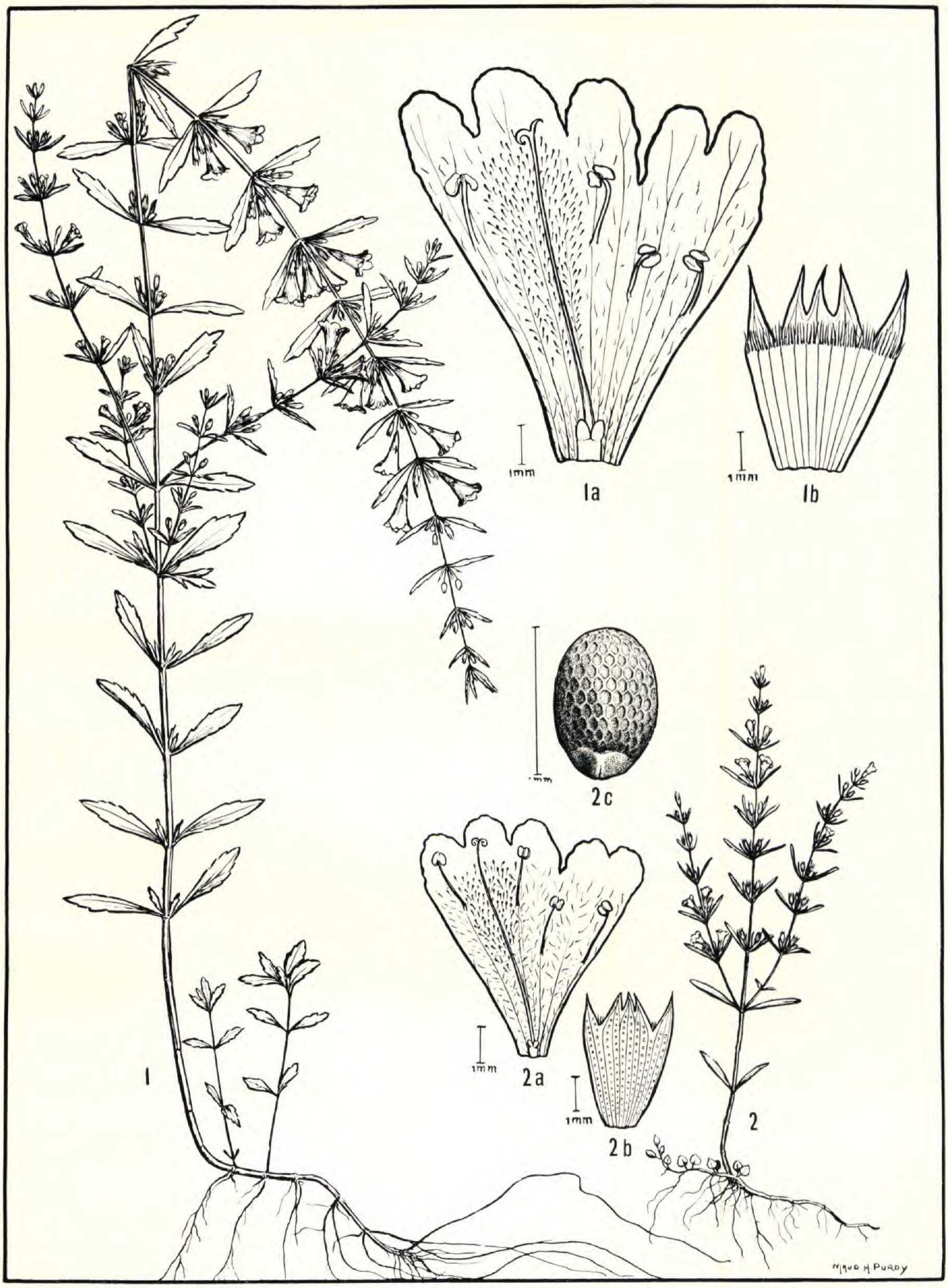
4. H. GALIOIDES Lam. Encyc. iv. 161 (1797) [PL. 587]. *H. nitidum* Lam. (l. c.) 160 (1797). *H. fasciculatum* Michx. Fl. Bor.-Am. 80 (1803); Willd. Sp. Pl. iii. 1452 (1803); non Lam. *H. Michauxii* Poir. Suppl. iii. 694, 696 (1813).

var. **fasciculatum** (Lam.) n. comb. (PL. 587, FIG. 2). *H. fasciculatum* Lam. Encyc. iv. 160 (1797). !*H. Coris* Walt. Fl. Carol. 190 (1788), non L. !*H. aspalathoides* Willd. Sp. Pl. iii. 1451 (1803).

H. fasciculatum (see PL. 587, FIG. 1) often has the axillary leaves strongly developed, so much so that the leaves scarcely appear to be verticillate, and has exceptionally dense clusters of terminal leaves. "Ces feuilles semblent disposées par faisceaux épais, apparence qui est due á de jeunes rameaux axillaires qui ne prennent que peu de développement" (Lamarck, l. c.). The Lamarck specimen at Paris is the same as Willdenow's specimen of *H. aspalathoides*[1] (coll. *Kinn*) which bears an old label "*H. rosmarinifolium*." Gray (T. & G. Fl. i. 672 (1840)) took this specimen as the type of *H. fasciculatum* var. *aspalathoides* and erroneously referred it to the var. β (op. cit. 160 (1838)) which obviously was intended for the most reduced form of the species, with leaves "2–3 lines [4–6 mm.] long," the var. *aspalathoides* of current usage. Lamarck's specimen has very narrow leaves 1–1.5 cm. long; in the Willdenow specimen they are about 12 mm. long, a little less revolute than in the Lamarck specimen and therefore sometimes nearly 3 mm. broad.

[1] Both the name and description of *H. aspalathoides* were accompanied by the letter "W" which Willdenow (op. cit. p. viii) explains as follows: "Nova mihi visa vegetabilia proprii Herbarii, littera W nomina triviali subsequente insignavi, et in descriptionibus a me factis eadem littera post has usus sum, more *Reichardi*, cujus R. quum quaedam adjecerat etiam adposui." New plants [i. e. species] seen by me in my own herbarium have the letter W signed after the trivial name, and after descriptions by me I have used the same letter in the manner of Reichard. . . .

Willdenow had both a description and a specimen. Since the specimen is typical *H. fasciculatum*, tne name is untenable, and the legality of Willdenow's procedure becomes inconsequential.



SATUREJA GLABELLA: FIG. 1, plant, × ½; FIG. 1a, corolla, enlarged; FIG. 1b, calyx, enlarged.

Var. ANGUSTIFOLIA: FIG. 2, plant, × ½; FIG. 2a, corolla, 2b, exterior of calyx and 3c, seed, all enlarged.

HYPERICUM GALIOIDES (× ½): FIG 1, var. FASCICULATUM; FIG. 2, heterophyllous form (Florida); FIG. 3, var. TYPICUM; FIG. 4, var. PALLIDUM; FIG. 5, var. REDUCTUM; FIG. 6, aff. var. CUBENSE; FIG. 7, intermediate form (close to H. NITIDUM); FIG. 8, var. LLOYDII.

It is evident that the greatest confusion exists in the minds of modern authors as to what the names *H. fasciculatum* and *H. galioides* represent, and it is equally obvious that the plants form an inseparable intergrading series, a conclusion which Treviranus long ago reached.[1] Because of this confusion I have cited very few recent authors. *H. galioides* seems to be closer than *H. fasciculatum* to the biological center of the species. The type of *H. galioides* at Paris, a collection from "carol. merid." by Fraser, has verticillate leaves, narrowly-linear but only slightly revolute, and dark brown capsules 3.5 mm. long, in loose cymose clusters. It is apparently identical with several collections from the vicinity of Wilmington, North Carolina, and is not so closely matched elsewhere. "Il a les feuilles presqu'aussi étroites que celles de l'*hypericum fasciculatum*, & souvent fasciculées d'une manière analogue, mais à faisceaux moins denses, qui les font plutôt paroître comme verticellées." A specimen closely resembling the type is illustrated (PL. 587, FIG. 3). *H. fasciculatum* Michx. [specimen examined in herb. Paris] has verticillate leaves and is identical with taller shrubby material, such as I have collected in southwestern Georgia.[2] Though I have not seen a specimen of *H. nitidum* Lam. it is obviously close to *H. fasciculatum* Michx. judging from the description "extrêment voisin de l'*hypericum fasciculatum:* cependant ses feuilles plus longues & plus luisantes, moins roides [stiff]" . . . The leaves were further described as very narrow,[3] pointed, opaque, and shiny as though varnished, some of them straight, but for the most part curved in an arc. Both *H. fasciculatum* Michx. and *H. nitidum* Lam. belong, without any question, in the heterogeneous

[1] Treviranus, L. C. In Hyperici genus. p. 15, Bonn. 1861.

"*Hyp. fasciculatum Lam.* Quae a *Lamarkio* in *Encycl.* IV sub *nris.* 37–41. propositae descriptaeque sunt plantae, scilicet *Hyp. rosmarinifolium, fasciculatum, nitidum, axillare, galioides* unius eiusdemque speciei videntur formae, ut mittamus recentiores quorundam sententias ac denominationes. Omnibus enim idem est locus natalis, omnium truncus suffruticosus teres rimosus, ramulis subangulatis subpatentibus, folia lanceolato-linearia, infra medium attenuata, obtusa margine reflexa, supra punctato-scabra, subtus glabra, patentia, axillis soboliferis. Calycis segmenta ("foliiformia" Mich.) linearia, petalis parum breviora obovatis cum acumine laterali. Antherae absque nota. Styli ad apicem usque coadunati. [These appear to be forms of one and the same species, as recent opinions and determinations attest. All are native to the same locality, the trunk in all is semi-shrubby, terete and fissured, the branches subangulate and somewhat spreading, the leaves lanceolate-linear, attenuate below the middle, obtuse with a reflexed margin, punctate-scabrous above, glabrous below, spreading, with axillary tufts.]

[2] Dr. R. M. Harper has recently sent me a picture of shrubs (probably of this form) from adjacent Florida, which are 12 feet (nearly 4 m.) high and 4 inches in diameter at the base.

[3] "à peine le tiers d'une ligne" [scarcely 0.7 mm. wide].

assemblage of plants lying between typical *H. galioides* and var. *fasciculatum*.

Var. **reductum** nom. nov. (PL. 587, FIG. 5). *H. fasciculatum* var. β. T. & G. Fl. N. Am. i. 160 (1838). *H. fasciculatum* var. *aspalathoides* T. & G. (l. c., p. 672) but not as to type in herb. Willd. *H. tenuifolium* Pursh, Fl. Am. Sept. ii. 377 (1814), fide T. & G. (l. c.). *H. fasciculatum* Lam. sensu Lott in Journ. Arnold Arb. xix. 279 (1938). This extreme, with verticillate leaves often as short as "2–3 lines" [4–6 mm.], appears to be common in the southern part of the coastal plain.

A small procumbent variant of *H. galioides* [cf. pl. 587, fig. 8] with long verticillate and revolute leaves from the piedmont (vicinity of Augusta, Georgia, and Aiken, South Carolina) may perhaps be worthy of distinction.

Var. PALLIDUM Mohr in Contrib. U. S. Nat. Herb. vi. 621 (1901); Lott in Journ. Arnold Arb. xix. 149 (1938). *H. galioides* Lam. var. *ambiguum* (Elliott?) Chapman, Fl. S. United States 40 (1860).

Elliott's description was inconclusive and refers as well to *H. densiflorum* as to a variation of *H. galioides*. Torrey & Gray (p. 673) saw the Elliott specimen and thought that it resembled "our H. rosmarinifolium." According to Mohr's description the leaves are ¼ inch [6 mm.] wide. Occasional specimens are encountered in the herbarium with leaves 7 or even 8 mm. wide. The leaves are thin, flat (not revolute), with numerous veins set at right angles to the midvein and branching in a dendritic fashion. The illustration (PL. 587, FIG. 4) is from a collection, distributed by Curtiss (no. 6483), from Florida. This variety is mentioned by Chapman as coming from "river swamps, Florida."

Grisebach, Cat. Pl. Cubens. 39 (1866) described *H. galioides* vars. *cubense*[1] and *axillare* from Cuba. Specimens from Cuba which I have seen have much the appearance of material from southern Florida, which I have figured (PL. 587, FIG. 6), but I cannot state with certainty just what the relationships are. The var. *axillare* was based upon *H. axillare* Lam. Encyc. iv. 161 (1797), referred by Gray (T. & G., p. 672) definitely to *H. galioides*. It is probably close to var. *pallidum* Mohr,

[1] "(Wr.[ight] 2126: recedit . . . foliis angustioribus lineari-filiformibus margine revolutis, sepalis angustis saepe inaequalibus); var. *axillare* Lam. sec. Trevir. (Wr. 2123: forma foliis brevioribus 4‴ [8 mm.] fere longis dense fasciculatis, floribus subsolitariis; frutex gracilis . . . ; eandem formam vidi in coll. Beyrichiana e Georgia sub nomine *H. fasciculati* Lam., etiam a b. Trevirano cum H. galioidi conjuncti)." Though var. *axillare* was based upon *H. axillare* Lam., Grisebach's description applies to a wholly different plant. [Treviranus made no new combinations under *H. galioides*.]

as to type, though verging toward tyical *H. galioides*. The flowers of *H. axillare* as described by Lamarck are fairly large, about 6 lines [about 13 mm.] in diameter, and situated in the axils of linear-lanceolate leaves about 15–20 mm. long and 5 mm. or less wide. These leaves were described as somewhat revolute on the margins and veinless below except for the midrib. There is some possibility that *H. axillare* may represent a narrow-leaved *H. densiflorum*, into which *H. galioides* seems at times to merge.

Some of these variations of *H. galioides* are of doubtful geographic significance and are probably not the equivalent of subspecies of zoological usage. The types upon which they are based represent fortuitous selections from a continuous linear series and serve principally as the loci around which specimens can be grouped.

5. H. FRONDOSUM Michx. Fl. Bor.-Am. ii. 81 (1803); Poir. Suppl. iii. 699 (1813); Lott in Journ. Arnold Arb. xix. 149 (1938). *H. aureum* Bartram, Travels 383 (1791), non Loureiro (1790).

The type, from rocks along the Tennessee River, has flowers 3 cm. in diameter; the largest leaves are 52 x 13 mm., somewhat glaucous below. This species apparently reaches its best development in the cedar glades near Nashville, Tennessee, where it frequently forms rounded bushes as much as a meter high. Otherwise the species is encountered in the form of sprawling shrubs adhering to limestone rocks of river bluffs in Tennessee and Alabama.

6. H. SPLENDENS Small, Bull. Torr. Bot. Cl. xxviii. 291 (1901); Man. 872 (1933).

This shrub, 0.5–1.5 meters tall, known only from Stone Mt., Georgia, is exceedingly close to *H. frondosum*, from which it may be distinguished by the "smaller firmer leaves, the more distinctly pedicelled flowers and the conic buds," as well as by the acuminate capsules which have comparatively thin walls. The type is represented by two sheets collected by Dr. Small showing material both in flower and in fruit.

7. H. APOCYNIFOLIUM Small, Bull. Torr. Bot. Cl. xxv. 616 (1898); Man. 871 (1933).

I suspect that the type of this species is the specimen (NY) collected by A. A. Heller in Texarkana, Texas, in August 1897, although Leavenworth's rather fragmentary specimens from Arkansas are also mentioned. Leavenworth's plants, evidently the type of *H. nudi-*

florum var. β T. & G., Fl. N. Am. i. 163 (1838), I believe represent *H. lobocarpum* Gattinger.

H. apocynifolium, closely related to *H. aureum*, is characterized by acute heavy-walled capsules and large, thin, glaucous leaves. It is a bush of river banks of the coastal plain, represented by only a few collections, as follows: GEORGIA: Chattahoochee River above Georgetown, Quitman Co., *R. M. Harper* no. 1755 (NY) [seeds of the *proficum* type, 1.7 mm. long]; St. Mary's River at Trader's Hill, Charlton Co., *R. M. Harper* no. 1501½ (NY). ALABAMA: shrub 2 ft., much branched, river bank, Tallapoosa Co., *F. S. Earle* no. 2141. TEXAS: Texarkana, *A. A. Heller* in Aug. 1897 (TYPE).

8. H. DOLABRIFORME Vent. Hort. Cels 45, t. 45 (1800); Coulter in Gray, Syn. Fl. 287 (1897); Britton & Brown, Ill. Fl. ii. 532, fig. 2889 [copy of Ventenat's plate] (1913). *H. procumbens* Desf. ex Willd. Sp. Pl. iii. 1450 (1803); Torrey & Gray, Fl. N. Am. i. 162 (1838); Coulter in Gray, Syn. Fl. 287 (1897).

H. dolabriforme was described by Ventenat (type not seen by me) from a specimen collected by Michaux "sur les collines très-arides du Kentucky," and illustrated by a plant which flowered in the greenhouse. The flowers are described as 3 cm. in diameter and correspond to those in Rédouté's plate (t. 45), therefore to be taken as illustrating the plant in natural size. The leaves thus have a maximum size of 4 cm. in length and 4 mm. width. The petals are 1.5 cm. long. The specimen which I have seen, most nearly conforming to these dimensions, is *Ruth* no. 2432 from Knoxville, which has the dried flowers 2.5 cm. in diameter.

H. dolabriforme seems to be confined to a limited area: KENTUCKY: Stony banks, Warren Co., *Eggert* in 1897; Monticello, Wayne Co., *Smith & Hodgdon* no. 4013; Bowling Green, *Eggert* in 1897; *Short*, sine loc. TENNESSEE: Knoxville, *Ruth* nos. 382, 2432, 6304, and collected also by Lamson-Scribner and Kearney; flat limestone rocks along road n. of Pikeville, Sequatchie Co., *Svenson* no. 8700 (B). GEORGIA: on flat exposed limestone rocks, eastern base of Pigeon Mountain, *R. M. Harper* no. 359 (NY).

The type of *H. procumbens* at Berlin (Willd. no. 14424) and fragments at Paris have revolute leaves 2–3 mm. wide and petals 8 mm. long, prominently mucronate at the apex. The type is close in appearance to a collection by Eggert from Bowling Green, Kentucky (Aug. 3, 1897) (NY). Accompanying the specimen at Berlin is an old label reading "petala quasi falcata. Descrit par Ventenat a ce qui je crois sous le nom d'obliquum sive falcatum. Amer. Sept." This specimen also has petals only 8 mm. long, narrow revolute leaves, and

the sepals of *H. dolabriforme*. Without doubt it belongs to that species, as Asa Gray long ago noted.

9. H. SPHAEROCARPUM Michx. Fl. Bor.-Am. ii. 78 (1803); T. & G., Fl. N. Am. i. 163 (1838). *H. nudiflorum* sensu Reichenbach, Icon. Bot. Exot. 60, t. 87 (1827), non Michx. *H. cistifolium* sensu Coulter in Gray, Syn. Fl. i. 287 (1897), non Lam.; Robinson & Fernald in Gray, Man. ed. 7, 574 (1908); Britton & Brown, Ill. Fl. ii. 532, fig. 2888 (1913); Small, Man. 871 (1933).

Michaux described the species as follows: "H. herbaceum, glaberrimum, erectum: foliis oblongis: panicula nuda, dichotoma; dichotomis omnibus 1-floris: stylo unico, demum tripartibili: capsula globosa. *Hab.* in Kentucky."

The type, examined by me at Paris, has the notation "Route de Louisville." It is more slender than most herbarium specimens which I have seen, with leaves not exceeding 8 mm. in width, and might conceivably be taken for an example of *H. denticulatum*, which occurs here and there in Kentucky, except for the united styles and rotund capsules. Some confusion has occurred with *H. nudiflorum*, which has broader shiny leaves, slender capsules, and reflexed calyx lobes. The rugose seeds of *H. sphaerocarpum* are twice as thick as those of *H. densiflorum*. From Kentucky the typical form of the species (with flat prominently-veined leaves 5–15 mm. wide and of strict growth) extends into the prairies of Illinois, Kansas, and Missouri. In the cedar glades near Nashville, *H. sphaerocarpum* abounds as a low bushy-branched ligneous plant with narrow, veinless, somewhat revolute leaves 2–7 mm. wide, and with sepals more or less glutinous. A similar form extends southward into the chalk barrens of southwestern Alabama. The seeds are identical with those of typical *H. sphaerocarpum*. This bushy-branched, narrow-leaved plant has a well-defined geographical distribution and should be treated as

H. sphaerocarpum var. **turgidum**, n. comb. (*H. turgidum* Small, Fl. Se. U. S. 788 (1903) and Man. 871 (1933).

The TYPE from Huntsville, Alabama, *Canby* no. 14 (NY) (Oct. 7, 1897) has leaves 4 mm. wide. By Harper[1] it is considered as similar to *H. sphaerocarpum* and "perhaps not specifically distinct."

10. H. CISTIFOLIUM Lam. Encyc. iv. 158 (1797); Watson, Bibl. Index 125 (1878), exclud. syn. *H. nudiflorum*. *H. rosmarinifolium* Lam. Encyc. iv. 159 (1797). *H. opacum* T. & G., Fl. N. Am. i. 163 (1838); Coulter in Gray, Syn. Fl. i. 287 (1897); Small, Man. 871 (1933).

[1] Trees, Shrubs, and Vines of Alabama, Geol. Surv. Ala. Mon. 9[2]. 273 (1928).